

Understanding Structural Constraints To Agripreneurship Adoption Among Smallholder Maize Farmers: Evidence From A Qualitative Study In Niger State, Nigeria

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Abstract

Agripreneurship is increasingly recognized as a pathway for improving agricultural productivity, commercialization, and rural livelihoods. However, its adoption among smallholder farmers remains constrained by persistent structural barriers, particularly in developing countries. This study explored the structural constraints influencing agripreneurship adoption among smallholder maize farmers in Niger State, Nigeria.

The study employed an interpretivist qualitative approach within a broader sequential explanatory mixed-methods design. Data were collected through Focus Group Discussions and Key Informant Interviews involving 50 purposively selected participants and analyzed using reflexive thematic analysis.

The findings identified seven interconnected constraints influencing agripreneurship adoption: financial exclusion, weak extension and training services, poor market infrastructure and price instability, climate variability, high input costs and scarcity, socio-cultural and institutional barriers, and rural insecurity. These constraints interacted to limit the adoption of improved seed varieties, post-harvest management, market-oriented farming, financial management and record-keeping, and agricultural training and extension services. Guided by the Technology–Organization–Environment (TOE) Framework and Institutional Theory, the findings demonstrate that agripreneurship adoption is shaped primarily by organizational and environmental conditions rather than technological considerations alone.

The study contributes context-specific qualitative evidence by demonstrating that agripreneurship adoption is influenced by interconnected structural conditions rather than isolated barriers. The findings highlight the need for integrated policies that strengthen rural finance, extension services, market infrastructure, institutional support, climate resilience, and rural security to promote sustainable agripreneurship among smallholder maize farmers.

Keywords: Agripreneurship adoption; structural constraints; smallholder maize farmers; Technology–Organization–Environment (TOE) Framework; Institutional Theory; qualitative research; Niger State, Nigeria

Introduction

Agripreneurship has increasingly been recognized as a strategic pathway for transforming agriculture from subsistence production into commercially oriented, innovative and sustainable enterprises that improve productivity, rural livelihoods and food security (Chaithanya & Saurav, 2025; Berdegué et al., 2025; Natarajan et al., 2025). Unlike conventional farming, agripreneurship integrates technological innovation, entrepreneurial decision-making, market orientation and business management to enhance

farm competitiveness and value-chain participation. Consequently, governments and development agencies across developing countries increasingly promote agripreneurship as a mechanism for accelerating agricultural transformation, strengthening food systems resilience and achieving sustainable rural development.

Despite these efforts, the adoption of agripreneurship practices among smallholder farmers remains uneven, particularly across Sub-Saharan Africa. Recent studies indicate that

farmers' adoption decisions are influenced not only by the perceived benefits of agricultural innovations but also by the organizational capacities of farming households and the broader institutional and environmental conditions within which they operate (Oyawole et al., 2025; Abdallah, 2025; Davis et al., 2025). Limited financial resources, weak extension services, inadequate market infrastructure, rising production risks, institutional weaknesses and rural insecurity continue to constrain the adoption of entrepreneurial farming practices, suggesting that agripreneurship is fundamentally a systemic rather than purely technological process.

Nigeria provides an important context for examining these challenges because agriculture remains central to employment, food production and rural livelihoods (Okpala & Ituma, 2025). Maize

Existing agripreneurship literature has made important contributions by identifying determinants of innovation adoption among farmers. However, most studies continue to emphasize individual socio-economic characteristics such as age, education, income, farm size and farming experience, while giving comparatively less attention to the organizational and environmental conditions within which entrepreneurial decisions are made. Moreover, many studies examine structural barriers independently, despite growing evidence that these constraints interact and reinforce one another in influencing innovation adoption (Oyawole et al., 2025; Dillon et al., 2025). Qualitative evidence explaining how these interconnected structural conditions shape agripreneurship adoption among smallholder maize farmers remains particularly limited in Nigeria.

Guided by the Technology-Organization-Environment (TOE) Framework, this study conceptualizes agripreneurship adoption as the outcome of interactions among three contexts. The technological context comprises the agripreneurship practices available to farmers, including improved seed varieties, post-harvest management, market-oriented farming, financial management and record keeping, and agricultural

is one of the country's most important staple and commercial crops, contributing substantially to household food security, livestock feed and agro-industrial production. Although successive agricultural transformation programmes have promoted improved seed technologies, extension reforms, agricultural finance and value-chain development, adoption of agripreneurship practices among many smallholder maize farmers remains below expectation due to persistent structural constraints (Janet, 2024). These challenges are particularly evident in Niger State, one of Nigeria's leading maize-producing states, where farmers continue to experience financial exclusion, inadequate advisory services, poor market systems, climate-related production risks, limited access to quality inputs and increasing rural insecurity (Zakari et al., 2025; Olanipekun et al., 2025).

training and extension services. The organizational context reflects farmers' internal capacities, including access to finance, extension support and productive inputs, while the environmental context encompasses market infrastructure, climate variability, institutional conditions and rural security. This perspective provides a more comprehensive explanation of agripreneurship adoption than approaches that focus primarily on technological characteristics or farmer attributes.

Against this background, this study explores the organizational and environmental constraints influencing agripreneurship adoption among smallholder maize farmers in Niger State, Nigeria. Guided by the Technology-Organization-Environment (TOE) framework and supported by qualitative evidence from Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs), the study examines how these interrelated constraints shape farmers' adoption of agripreneurship practices and identifies context-specific implications for strengthening entrepreneurial agriculture.

The study contributes to the agripreneurship literature in four important ways. First, it shifts the analytical focus from individual adoption determinants to the structural conditions that constrain agripreneurship adoption. Second, it provides rich qualitative evidence that

complements the predominantly quantitative literature on agricultural innovation adoption. Third, it extends the application of the Technology-Organization-Environment (TOE) framework by demonstrating how organizational and environmental constraints-including rural insecurity-shape agripreneurship adoption within smallholder farming systems. Finally, the study offers context-specific policy recommendations for strengthening agripreneurship through coordinated improvements in rural finance, extension delivery, market infrastructure, institutional capacity, climate resilience, and rural security, thereby contributing to more inclusive and sustainable agricultural transformation in Nigeria and other developing-country contexts.

1.2 Problem Statement

Despite growing recognition of agripreneurship as a catalyst for agricultural transformation, productivity improvement, and food security, its adoption among smallholder farmers in developing countries remains limited. Although governments and development partners have expanded investments in agricultural finance, extension services, improved technologies, and value-chain development, these interventions have not produced the expected level of entrepreneurial transformation among smallholder farmers (Chaithanya & Saurav, 2025; Berdegú et al., 2025; Oyawole et al., 2025). This suggests that agripreneurship adoption is influenced not only by the availability of innovations but also by farmers' organizational capacities and the broader institutional and environmental conditions within which agricultural enterprises operate.

2. Literature Review

2.1 Conceptualizing Agripreneurship

Agripreneurship refers to the application of entrepreneurial principles to agricultural production and agribusiness through innovation, commercialization, efficient resource management, and market orientation (Chaithanya & Saurav, 2025). Unlike subsistence farming, agripreneurship emphasizes opportunity recognition, value creation, business management, risk-taking, and participation in agricultural markets. It transforms agriculture into a

Existing studies have largely relied on quantitative approaches that examine the independent effects of farmers' socio-economic characteristics or selected adoption determinants. Consequently, limited empirical attention has been given to how organizational constraints (such as limited finance, weak extension support, and inadequate access to productive inputs) interact with environmental constraints (including weak market systems, climate variability, institutional deficiencies, and rural insecurity) to shape agripreneurship adoption. This limitation is particularly evident in Nigeria, where qualitative evidence capturing farmers' lived experiences and contextual realities remains scarce, especially in major maize-producing regions such as Niger State (Zakari et al., 2025; Olanipekun et al., 2025; Raza et al., 2026).

Guided by the Technology-Organization-Environment (TOE) Framework, this study addresses this gap by exploring the organizational and environmental constraints influencing agripreneurship adoption among smallholder maize farmers in Niger State using evidence from Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs). By providing an integrated qualitative explanation of how these interrelated constraints influence entrepreneurial decision-making, the study contributes to a more comprehensive understanding of agripreneurship adoption and generates evidence for policies that strengthen the enabling environment for sustainable agricultural transformation

competitive enterprise capable of generating economic, social, and environmental value (Berdegú et al., 2025).

Growing interest in agripreneurship reflects its potential to improve productivity, strengthen rural livelihoods, promote food security, and accelerate agricultural transformation, particularly among smallholder farmers in developing countries (Chaithanya & Saurav, 2025; Natarajan et al., 2025). Accordingly, this study operationalizes agripreneurship through five entrepreneurial farming practices: Improved Seed Varieties (ISV), Post-Harvest Management (PHM), Market-

Oriented Farming (MOF), Financial Management and Record Keeping (FMRK), and Agricultural Training and Extension Services (ATES). These practices collectively enhance innovation, productivity, business management, and market competitiveness.

2.2 Conceptualizing Agripreneurship Adoption

Agripreneurship adoption refers to the process through which farmers accept, implement, adapt, and sustain entrepreneurial agricultural practices after evaluating their relevance and expected benefits (Davis et al., 2025; Sithole et al., 2024). Adoption is therefore a continuous process rather than a one-time event, involving the implementation and sustained use of agricultural innovations.

Recent studies emphasize that adoption depends not only on farmers' willingness to innovate but also on access to finance, extension services, productive technologies, markets, and supportive institutional environments (Oyawole et al., 2025; Raza et al., 2026). Consequently, agripreneurship adoption is increasingly understood as the outcome of interactions between farmers' entrepreneurial behaviour and the broader institutional and business environment. Evidence consistently shows that financial services, effective extension systems, functional markets, climate-resilient technologies, and supportive institutions are critical for sustaining entrepreneurial agriculture (Dillon et al., 2025; Abdallah, 2025; Raza et al., 2026).

2.3 Structural Constraints to Agripreneurship Adoption

Structural constraints are the institutional, economic, infrastructural, environmental, and socio-political conditions that influence farmers' ability to adopt and sustain agripreneurship practices. Unlike individual characteristics such as age or education, these constraints originate from the broader agricultural system and determine farmers' access to productive resources, markets, finance, infrastructure, and institutional support (Raza et al., 2026; Dillon et al., 2025).

The literature consistently identifies limited access to agricultural finance, weak extension services, inadequate market infrastructure, climate-related risks, high input costs, institutional weaknesses,

and rural insecurity as major barriers to entrepreneurial agriculture among smallholder farmers (Oyawole et al., 2025; Davis et al., 2025; Abdallah, 2025; Berdegué et al., 2025). These barriers rarely operate independently; rather, they reinforce one another to create a complex environment that constrains agripreneurship adoption (Natarajan et al., 2025; Dillon et al., 2025; Raza et al., 2026).

Guided by the Technology–Organization–Environment (TOE) Framework and Institutional Theory, this study examines seven interrelated structural constraints: financial constraints and limited credit access; weak extension and training support; poor market infrastructure and price instability; climate variability and environmental stress; high cost and scarcity of farm inputs; socio-cultural and institutional constraints; and insecurity and rural farming vulnerability. Together, these dimensions provide the conceptual basis for understanding the organizational and environmental conditions shaping agripreneurship adoption among smallholder maize farmers in Niger State, Nigeria.

2.3 Empirical Review

Recent empirical studies indicate that agripreneurship adoption among smallholder farmers is shaped largely by structural rather than individual factors. Evidence from Sub-Saharan Africa consistently identifies access to finance, extension and advisory services, market infrastructure, institutional quality, climate resilience, input availability, and rural security as key determinants of entrepreneurial agriculture (Adesiyun, 2025; Dillon et al., 2025; Raza et al., 2026). Collectively, these studies suggest that agripreneurship thrives where farmers operate within supportive institutional and market environments.

Financial exclusion remains one of the most widely reported constraints. Access to affordable agricultural credit enhances farmers' investment in improved technologies and commercialization, whereas inadequate finance limits innovation and enterprise expansion (Bang & Han, 2025; Zhang et al., 2025). Similarly, effective extension services improve farmers' technical knowledge and entrepreneurial capabilities, while weak advisory

systems constrain the adoption of innovative agricultural practices (Kyari et al., 2025; Okringbo et al., 2025). Studies also highlight poor market infrastructure, unstable commodity prices, climate variability, and the high cost of farm inputs as significant barriers that reduce expected returns from innovation and discourage entrepreneurial investment (Chirombo & Phiri, 2025; Daudu et al., 2025; Idisi et al., 2025; Kamara et al., 2025; Li et al., 2025).

Beyond economic and technical factors, recent evidence increasingly recognizes institutional quality and rural security as important determinants of agripreneurship adoption. Weak governance, inadequate policy support, socio-cultural barriers, and growing insecurity have been shown to restrict access to productive resources, disrupt agricultural value chains, and discourage long-term investment in entrepreneurial agriculture (Adebayo et al., 2025; FAO, 2024; Ibrahim et al., 2025; Olumba et al., 2025; Zakari et al., 2025).

Despite these advances, three important gaps remain. First, the literature is dominated by cross-sectional quantitative studies that examine structural factors in isolation, providing limited understanding of their interrelationships. Second, relatively few studies have explored farmers' lived experiences of these constraints through qualitative inquiry. Third, empirical evidence focusing specifically on smallholder maize farmers in Niger State, Nigeria, remains limited despite the state's strategic role in national maize production. Addressing these gaps, this study employs Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs) to provide an in-depth understanding of the interconnected structural constraints shaping agripreneurship adoption among smallholder maize farmers in Niger State.

2.4 The Technology-Organization-Environment (TOE) Framework

The Technology–Organization–Environment (TOE) framework, developed by Tornatzky and Fleischer (1990), explains innovation adoption as the result

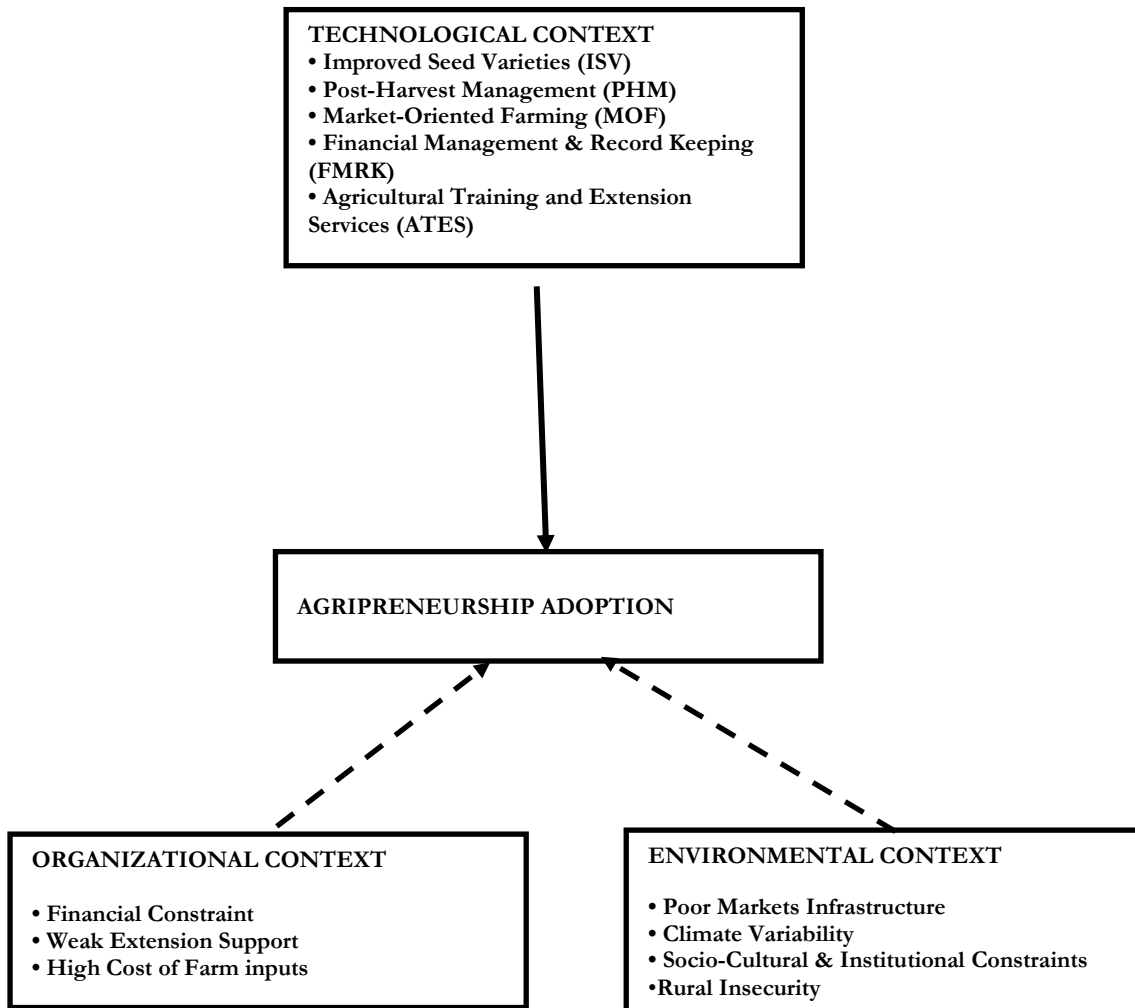
of interactions among technological, organizational, and environmental contexts. Originally developed to explain organizational innovation, the framework has been widely applied in agriculture because it recognizes that adoption depends not only on the characteristics of an innovation but also on adopters' internal capabilities and the external environment in which they operate (Davis et al., 2025; Purnamasari et al., 2025). Recent studies have increasingly employed the TOE framework to explain variations in agricultural innovation adoption across developing countries (Abdallah, 2025; Kanakulya et al., 2026).

In this study, the technological context comprises the agripreneurship practices available to smallholder maize farmers, namely improved seed varieties, post-harvest management, market-oriented farming, financial management and record keeping, and agricultural training and extension services. The organizational context represents the internal resources and capabilities required to implement these practices, including access to finance, extension support, technical knowledge, and productive inputs. The environmental context captures the broader institutional and operating environment within which farmers make entrepreneurial decisions, including market infrastructure, climate variability, socio-cultural and institutional conditions, and rural insecurity.

The TOE framework provides the analytical lens for examining how these three contexts interact to influence agripreneurship adoption. Rather than viewing adoption as a consequence of technological characteristics alone, the framework recognizes that entrepreneurial farming depends on the combined effects of innovation availability, organizational readiness, and a supportive external environment. Accordingly, the framework guided the organization, analysis, and interpretation of the qualitative findings. As illustrated in Figure 2.1, agripreneurship adoption is conceptualized as the outcome of interactions among technological opportunities, organizational capacity, and environmental conditions.

Figure 2.1

Conceptual Framework of the Technology-Organization-Environment (TOE) Contexts Influencing Agripreneurship Adoption among Smallholder Maize Farmers



Note: Adapted from (Tornatzky & Fleischer, 1990) and operationalized for the present study

As illustrated in **Fig 2.1**, the technological context represents the agripreneurship practices available to farmers. These include Improved Seed Varieties (ISV), Post-Harvest Management (PHM), Market-Oriented Farming (MOF), Financial Management and Record Keeping (FMRK), and Agricultural Training and Extension Services (ATES). Collectively, these practices constitute the technological innovations whose adoption is influenced by farmers' perceptions of their usefulness, accessibility, and compatibility with existing farming systems.

The organizational context captures the internal capacities that enable or constrain farmers' ability to adopt these agripreneurship practices. It comprises financial constraints and limited credit access, weak agricultural extension and training support, and the high cost and scarcity of farm inputs. These organizational conditions determine farmers' ability to mobilise financial resources, acquire technical knowledge, and access the productive inputs required for entrepreneurial agriculture.

The environmental context represents the external conditions within which agripreneurship adoption occurs. It includes poor market infrastructure and price instability, climate variability and environmental stress, socio-cultural and institutional constraints, and insecurity and rural farming vulnerability. These factors shape farmers' access to markets, institutional support, productive resources, and a secure operating environment for agricultural investment.

The framework proposes that agripreneurship adoption is the outcome of interactions among these three contexts. Specifically, the adoption of agripreneurship practices depends on the availability of relevant technological innovations, the organizational capacity of farmers to implement them, and the conduciveness of the surrounding institutional and environmental conditions. The framework therefore provides the conceptual basis for organizing the qualitative findings and interpreting the interconnected structural constraints influencing agripreneurship adoption among smallholder maize farmers in Niger State.

3. Methodology

This study employed a qualitative design within an interpretivist paradigm to explore the organizational and environmental constraints influencing agripreneurship adoption among smallholder maize farmers in Niger State, Nigeria. The study forms part of a broader sequential explanatory mixed-methods research, although only the qualitative component is reported here. Niger State was selected because of its strategic importance in Nigeria's maize value chain and the persistent challenges facing smallholder farmers, including limited access to finance, weak extension services, poor market infrastructure, climate variability, and rural insecurity.

Data were collected through Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs) involving 50 purposively selected participants drawn from the state's three agricultural zones. Participants included smallholder maize farmers, agricultural extension officers, officials of the Maize Growers, Processors and Marketers Association of Nigeria (MAGPAMAN), agricultural programme managers, community leaders, and experienced

farmers. Purposive sampling ensured the inclusion of participants with diverse farming experiences, institutional roles, and geographical representation capable of providing rich insights into agripreneurship adoption.

Semi-structured interview guides, developed from the study objectives and the Technology–Organization–Environment (TOE) framework, were used to explore participants' experiences with agripreneurship practices and the organizational and environmental conditions influencing their adoption. FGDs elicited farmers' collective experiences, while KIIs provided complementary institutional and policy perspectives. Interviews were conducted in English or Hausa according to participants' preferences, audio-recorded with informed consent, and supplemented with field notes.

Data were analysed using Braun and Clarke's (2022) reflexive thematic analysis. Audio recordings were transcribed verbatim and translated into English where necessary. Following repeated familiarization with the transcripts, initial codes were generated manually in Microsoft Word and subsequently organized into categories and themes using Microsoft Excel. Guided by the TOE framework, the analysis identified seven interrelated constraints to agripreneurship adoption: financial constraints and limited credit access, weak extension and training support, poor market infrastructure and price instability, climate variability and environmental stress, high cost and scarcity of farm inputs, socio-cultural and institutional constraints, and rural insecurity.

The trustworthiness of the findings was enhanced through methodological triangulation of FGDs and KIIs, systematic documentation of coding decisions, and rich contextual descriptions in accordance with Lincoln and Guba's (1985) criteria of credibility, dependability, confirmability, and transferability. Ethical approval was obtained for the broader study, and all participants provided informed consent before data collection. Confidentiality and anonymity were maintained throughout the research by using participant identification codes.

4. Results and Discussion

4.1 Participant Characteristics

The qualitative phase involved 50 purposively selected participants comprising smallholder maize farmers and key agricultural stakeholders from the three agricultural zones of Niger State. Participants represented diverse demographic backgrounds in terms of gender, age, educational attainment, household size and farming experience, thereby

ensuring a broad range of perspectives on agripreneurship adoption. Most participants were male (80%), married (80%), between 40 and 49 years of age (40%), and had more than ten years of farming experience (70%), indicating substantial practical knowledge of maize production and entrepreneurial farming.

Table 4.1

Participant Characteristics

Characteristic	Category	Frequency	Percentage (%)
Gender	Male	40	80.0
	Female	10	20.0
Age (Years)	Below 30	4	8.0
	30-39	12	24.0
	40-49	20	40.0
	50-59	10	20.0
	60 and Above	4	8.0
Marital Status	Single	4	8.0
	Married	40	80.0
	Widowed	4	8.0
	Divorced/Separated	2	4.0
Educational Level	No Formal Education	10	20.0
	Primary Education	10	20.0
	Secondary Education	18	36.0
	Tertiary Education	9	18.0
	Post Graduate Education	3	6.0
Household Size	1-3 Members	4	8.0
	4-6 Members	16	32.0
	7-9 Members	18	36.0
	10 and Above	12	24.0
Farming Experience	Less than 5 Years	4	8.0
	5-10 Years	11	22.0
	11-20 Years	21	42.0
	Above 20 Years	14	28.0

4.2 Emergent Themes

Reflexive thematic analysis identified seven interrelated constraints to agripreneurship adoption. Consistent with the Technology-Organization-Environment (TOE) framework, these

themes were subsequently organized into organizational and environmental contexts, while the agripreneurship practices investigated in the study represented the technological context. **Table 4.1** summarizes the themes, illustrative quotations and their interpretation.

Table 4.1

Reflexive Thematic Analysis Matrix for Structural Constraints Hindering Adoption

Theme	Sub-theme	Supporting Evidences	Interpretation
Financial Constraints and Limited Credit Access	Capital shortage; Credit barriers	"Banks demand collateral." (P3) "Credit is difficult to obtain." (P21) "Finance limits expansion." (P45)	Financial limitations remain the most dominant barrier to agripreneurship adoption.
Weak Extension and Training Support	Advisory services; Capacity building	"Extension officers rarely visit." (P4) "Training opportunities are limited." (P23) "Farmers need more technical support." (P40)	Weak extension systems constrain knowledge transfer and innovation adoption.
Poor Market Infrastructure and Price Instability	Market access; Price volatility	"Roads are poor." (P10) "Prices fluctuate constantly." (P25) "Market uncertainty affects profits." (P47)	Market inefficiencies discourage commercialization and entrepreneurial investment.
Climate Variability and Environmental Stress	Drought; Flooding; Weather uncertainty	"Rainfall is unpredictable." (P12) "Flooding damages crops." (P27) "Climate change affects production." (P44)	Climate risks increase production uncertainty and reduce adoption confidence.
High Cost and Scarcity of Farm Inputs	Expensive inputs; Input shortages	"Inputs are becoming too expensive." (P14) "Seeds are not always available." (P35) "Farmers cannot afford recommended inputs." (P49)	Input constraints limit the implementation of agripreneurship practices.
Socio-Cultural and Institutional Constraints	Traditional beliefs; Weak institutions	"Farmers prefer traditional methods." (P13) "Land access remains difficult." (P30) "Government support is inadequate." (P42)	Institutional and socio-cultural factors constrain innovation adoption.
Insecurity and Rural Farming Vulnerability	Banditry; Kidnapping; Restricted farm access	"Many of us can no longer cultivate our distant farms because of fear of attacks and kidnapping." (P18); "Sometimes we prepare for	Rural insecurity undermines entrepreneurial investment by increasing production

farming, but insecurity risks and disrupting forces us to abandon the agricultural value farm completely." (P33); chains.
"Even when you have money for improved seeds and fertilizer, insecurity makes you afraid to invest because you may never harvest the crops." (P47)

Note. Source: Researcher's Field Survey, 2025

To further demonstrate the robustness of the qualitative findings, **Table 4.2** presents the distribution of participant contributions across the identified themes. The table summarizes participant coverage, gender representation, and supporting participant identifiers for each theme, thereby illustrating the breadth of evidence

underpinning the emergent themes. This thematic distribution confirms that the identified structural constraints were consistently reported across participants, providing a credible basis for the subsequent presentation and discussion of the findings

Table 4.2 *Reflexive Thematic Analysis Matrix for Structural Constraints Hindering Adoption*

Theme	Participant Coverage	Male Cases	Female Cases	Supporting Cases
Financial Constraints and Limited Credit Access	20/50 (40%)	16	4	P1, P3, P5, P7, P9, P11, P13, P15, P17, P19, P21, P23, P25, P27, P29, P31, P33, P35, P37, P39
Weak Extension and Training Support	19/50 (38%)	15	4	P2, P4, P6, P8, P10, P12, P14, P16, P18, P20, P22, P24, P26, P28, P30, P32, P34, P36, P38
Poor Market Infrastructure and Price Instability	17/50 (34%)	14	3	P5, P7, P9, P11, P13, P15, P17, P19, P21, P23, P25, P27, P29, P31, P33, P35, P37
Climate Variability and Environmental Stress	15/50 (30%)	12	3	P4, P8, P12, P16, P20, P24, P28, P32, P36, P40, P44, P46, P47, P48, P49
High Cost and Scarcity of Farm Inputs	15/50 (30%)	12	3	P1, P6, P10, P14, P18, P22, P26, P30, P34, P38, P42, P45, P46, P47, P50
Socio-Cultural and Institutional Constraints	13/50 (26%)	10	3	P2, P7, P12, P17, P22, P27, P32, P37, P42, P45, P46, P48, P49

Insecurity and
 Rural Farming 18/50 (36%) 15 4
 Vulnerability

P14, P18, P22, P26, P33, P34, P38, P42, P47,
 P46, P12, P17, P22, P27, P32, P37, P45, P48

Note. Source: Researcher's Field Survey, 2025

4.3 Findings

The discussion is structured according to the conceptual framework presented in Figure 2.1. Although the technological context defines the agripreneurship practices available for adoption, the findings indicate that adoption is primarily conditioned by organizational and environmental factors. Accordingly, the discussion first situates the technological context before examining how organizational and environmental constraints shape farmers' ability to adopt these practices.

4.3.1 Technological Context

As illustrated in Figure 2.1, the technological context comprises the five agripreneurship practices examined in this study: improved seed varieties, post-harvest management, market-oriented farming, financial management and record keeping, and agricultural training and extension services. Consistent with the TOE framework, these practices represent the innovations available for adoption and are assessed in terms of their perceived usefulness, accessibility, and compatibility with existing farming systems (Tornatzky & Fleischer, 1990). Rather than functioning as isolated technologies, the five practices constitute complementary entrepreneurial innovations that enable smallholder maize farmers to enhance productivity, profitability, sustainability, and food security.

"Banks demand collateral" (P3);

"Credit is difficult to obtain" (P21); and

"Finance limits expansion" (P45).

Participants indicated that personal savings, informal borrowing, and family support were often insufficient to finance entrepreneurial agricultural investment.

"Extension officers rarely visit" (P4)

"Training opportunities are limited" (P23); and

"Farmers need more technical support" (P40).

However, as the findings demonstrate, the adoption of these practices depends not only on their technological attributes but also on the organizational capacities of farmers and the wider environmental conditions within which they operate.

4.3.2 Organizational Context

The qualitative findings revealed that the organizational context of agripreneurship adoption was characterized by limited internal resource capacity, reflected in restricted access to finance, weak agricultural extension and training support, and the high cost and scarcity of productive farm inputs. Participants consistently explained that these organizational constraints interacted to reduce their ability to implement agripreneurship practices, including improved seed varieties, post-harvest management, market-oriented farming, financial management and record-keeping, and agricultural training and extension services.

Financial limitations emerged as a major barrier to entrepreneurial investment. Many participants reported that inadequate financial resources, stringent lending conditions, collateral requirements, and limited access to affordable credit constrained their ability to purchase improved inputs, adopt mechanization, and invest in modern farming practices. Representative responses included:

Participants also highlighted deficiencies in agricultural extension and training services as an important organizational challenge. They explained that infrequent extension visits, inadequate technical guidance, and limited entrepreneurial training reduced their capacity to implement recommended agripreneurship practices. Typical responses included:

Consequently, many farmers relied primarily on personal experience and informal knowledge when making production and business decisions.

Closely linked to these constraints was the high cost and irregular availability of productive farm inputs. Participants reported that improved seed varieties, fertilizers, agrochemicals, and mechanization services had become increasingly expensive and were often unavailable during critical stages of the farming season. Representative responses included:

"Inputs are becoming too expensive" (P14);

"Seeds are not always available" (P35); and

"Farmers cannot afford recommended inputs" (P49). These challenges frequently compelled

4.3.3 Environmental Context

The qualitative findings revealed that the environmental context of agripreneurship adoption was shaped by interconnected market, climatic, institutional, socio-cultural, and security conditions operating beyond the control of individual farmers. Participants consistently explained that poor market infrastructure and price instability, climate variability and environmental stress, socio-cultural and institutional barriers, and growing rural insecurity collectively constrained their willingness and capacity to invest in agripreneurship practices. These external conditions created an operating environment characterized by uncertainty, high production risks, and limited institutional support, thereby discouraging entrepreneurial agricultural investment.

Market-related constraints were among the most frequently reported environmental challenges. Participants described poor rural road networks, inadequate storage facilities, weak market linkages, high transportation costs, limited access to market information, and unstable commodity prices as major impediments to commercialization. Typical responses included:

"Roads are poor" (P10)

"Prices fluctuate constantly" (P25)

"Market uncertainty affects profits" (P47)

These conditions reduced profitability, increased marketing uncertainty, and weakened farmers' incentives to invest in agripreneurship.

farmers to reduce input use, substitute lower-quality alternatives, or continue with traditional production practices, thereby limiting the adoption of agripreneurship innovations.

Overall, the findings suggest that organizational capacity extends beyond the availability of innovations to encompass the financial, technical, and productive resources required for their effective implementation. The interaction of financial exclusion, weak advisory support, and input constraints substantially reduced farmers' readiness to adopt agripreneurship practices.

Participants also identified climate variability and environmental stress as important constraints to entrepreneurial farming. Irregular rainfall, prolonged droughts, flooding, declining soil fertility, pest infestations, and rising temperatures were reported to increase production uncertainty and investment risks. Representative responses included:

"Rainfall is unpredictable" (P12)

"Flooding damages crops" (P27)

"Climate change affects production" (P44)

Although some participants reported adopting improved seed varieties and climate-smart practices to cope with these challenges, most considered climatic uncertainty a major obstacle to sustained agripreneurship adoption.

The environmental context was further influenced by socio-cultural and institutional conditions. Participants explained that traditional farming practices, limited access to land, weak farmer organizations, bureaucratic procedures, and inadequate government support constrained access to productive resources and discouraged innovation. Typical responses included:

"Farmers prefer traditional methods" (P13)

"Land access remains difficult" (P30)

"Government support is inadequate" (P42)

These findings suggest that institutional weaknesses and socio-cultural norms continue to shape entrepreneurial behaviour within smallholder farming systems.

Perhaps the most pervasive environmental constraint identified was rural insecurity. Participants, particularly from Rafi, Shiroro, Munya, Paikoro, and parts of Zone C, described how banditry, kidnapping, violent attacks, and displacement disrupted farming activities, restricted access to farmlands and markets, and discouraged investment in improved agricultural technologies. One participant lamented that

"Many of us can no longer cultivate our distant farms because of fear of attacks and kidnapping" (P18)

"Sometimes we prepare for farming, but insecurity forces us to abandon the farm completely" (P33)

"Even when you have money for improved seeds and fertilizer, insecurity makes you afraid to invest because you may never harvest the crops" (P47)

Collectively, these accounts demonstrate that insecurity extends beyond a security challenge to become a fundamental environmental condition shaping entrepreneurial agricultural behaviour.

Overall, the findings indicate that agripreneurship adoption among smallholder maize farmers is influenced not only by the availability of agricultural innovations but also by the broader market, institutional, ecological, and security environment within which entrepreneurial decisions are made. The interaction of these environmental constraints substantially reduced farmers' confidence and capacity to adopt and sustain agripreneurship practices.

4.4 Discussion

The findings are interpreted through the conceptual framework (Figure 2.1), which adapts the Technology-Organization-Environment (TOE) framework to explain agripreneurship adoption among smallholder maize farmers. The framework conceptualizes adoption as the outcome of interactions among three complementary contexts: the technological context, represented by agripreneurship practices; the organizational context, represented by farmers' internal resources and capabilities; and the environmental context, represented by the external institutional and operating environment. Consistent with this framework, the findings indicate that while farmers

generally perceived agripreneurship practices as beneficial, their adoption depended primarily on organizational capacity and environmental conditions rather than on the characteristics of the innovations themselves.

Within the conceptual framework (Figure 2.1), the technological context comprises the five agripreneurship practices investigated in this study: improved seed varieties, post-harvest management, market-oriented farming, financial management and record-keeping, and agricultural training and extension services. Participants consistently recognized these practices as valuable innovations capable of improving productivity, profitability, sustainability, and food security. Improved seed varieties were perceived to enhance yields, post-harvest management reduced storage losses, market-oriented farming increased income opportunities, financial management strengthened farm decision-making, while agricultural training and extension services improved technical and entrepreneurial knowledge. These findings suggest that the technological innovations themselves were not rejected by farmers. Rather, their perceived usefulness was widely acknowledged. This supports the technological dimension of the TOE framework, which posits that innovations possessing clear relative advantages are more likely to be accepted by potential adopters (Tornatzky & Fleischer, 1990). However, the study further demonstrates that favourable perceptions of agripreneurship practices alone were insufficient to ensure adoption, as farmers' ability to implement these innovations depended on the availability of organizational resources and a supportive external environment.

Within the conceptual framework (Figure 2.1), the organizational context represents the internal capacity of smallholder farmers to implement agripreneurship practices through access to financial resources, advisory services, technical knowledge, and productive inputs. Although the TOE framework was originally developed for formal organizations, this study conceptualizes the smallholder farm as an entrepreneurial production unit whose capacity to innovate depends on the availability of these organizational resources. The qualitative findings revealed that organizational

capacity was constrained by three mutually reinforcing factors: limited access to finance and credit, weak agricultural extension and training support, and the high cost and scarcity of farm inputs. Together, these constraints reduced farmers' ability to adopt and sustain improved seed varieties, post-harvest management, market-oriented farming, financial management and record-keeping, and agricultural training and extension services. These findings support the central proposition of the TOE framework that innovation adoption depends not only on the technology itself but also on the organizational resources required for its implementation. They are consistent with previous studies identifying access to finance, effective extension services, and reliable input supply systems as critical drivers of agricultural innovation among smallholder farmers (Bang & Han, 2025; Kamara et al., 2025; Kyari et al., 2025; Okringbo et al., 2025; Zhang et al., 2025). Beyond confirming earlier evidence, the present study demonstrates that these organizational constraints operate interactively rather than independently, collectively weakening farmers' readiness to adopt agripreneurship practices.

The environmental context of the conceptual framework captures the external institutional, market, socio-cultural, ecological, and security conditions within which agripreneurship adoption occurs. The findings show that these external conditions substantially shaped farmers' entrepreneurial decisions. Poor market infrastructure and unstable commodity prices reduced expected returns from investment, while climate variability increased production uncertainty and heightened farmers' risk perceptions. Institutional weaknesses, including inadequate government support, weak farmer organizations, and socio-cultural barriers, further constrained access to productive resources and innovation opportunities. Most notably, insecurity emerged as the most pervasive environmental constraint, restricting access to farmland, markets, extension services, and other productive resources while undermining farmers' confidence to invest in entrepreneurial agriculture. These findings reinforce the environmental dimension of the TOE framework by demonstrating that external conditions substantially influence innovation

adoption. They also corroborate recent evidence showing that weak market systems, climate-related shocks, institutional deficiencies, and rural insecurity significantly constrain agricultural innovation and commercialization in developing countries (Chirombo & Phiri, 2025; Daudu et al., 2025; FAO, 2024; Ibrahim et al., 2025; Idisi et al., 2025; Olumba et al., 2025).

Taken together, the findings demonstrate that agripreneurship adoption is constrained by an interconnected system of technological, organizational, and environmental conditions. While farmers recognized the potential value of agripreneurship practices, their adoption was constrained by limited organizational capacity and an unfavourable operating environment. Financial exclusion reduced farmers' ability to acquire productive inputs, weak extension services limited their capacity to utilize available technologies effectively, and these constraints were further intensified by poor market conditions, climate risks, institutional deficiencies, and insecurity, creating a reinforcing cycle that discouraged entrepreneurial investment. By empirically demonstrating the interdependence of the technological, organizational, and environmental contexts proposed in the conceptual framework (Figure 2.1), this study extends the application of the TOE framework beyond its traditional organizational setting to smallholder agriculture. It shows that successful agripreneurship requires coordinated improvements in rural finance, extension delivery, input distribution, market infrastructure, institutional effectiveness, climate resilience, and rural security, rather than isolated interventions targeting individual constraints.

5. Conclusion

This study explored the structural conditions influencing agripreneurship adoption among smallholder maize farmers in Niger State, Nigeria, through the lens of the Technology–Organization–Environment (TOE) framework. The findings demonstrate that although farmers generally perceived agripreneurship practices - including improved seed varieties, post-harvest management, market-oriented farming, financial management and record-keeping, and agricultural training and extension services - as beneficial, their

adoption was constrained primarily by organizational and environmental conditions rather than by the technologies themselves. Limited access to finance, weak extension support, high input costs, poor market infrastructure, climate variability, institutional deficiencies, and rural insecurity collectively reduced farmers' capacity and willingness to adopt entrepreneurial agricultural innovations.

The study extends the application of the TOE framework to smallholder agripreneurship by demonstrating that adoption is shaped by the interaction of technological, organizational, and environmental contexts. It contributes context-specific qualitative evidence from Nigeria and highlights the need for integrated interventions that strengthen farmers' organizational capacity while improving the broader rural operating environment. Policies that simultaneously expand access to finance, enhance extension services, improve input and market systems, strengthen institutional support, promote climate resilience,

and address rural insecurity are likely to accelerate agripreneurship adoption and support sustainable agricultural transformation in Nigeria and comparable smallholder farming systems.

6. Limitations and Future Research

This study is subject to certain limitations. It focused on smallholder maize farmers in Niger State, Nigeria; therefore, the findings are context-specific and may not be directly transferable to other agricultural systems or regions. In addition, the qualitative design provides in-depth insights into participants' experiences but does not permit statistical generalization. Future research should extend this work through comparative and longitudinal studies across different agricultural contexts and employ mixed-methods or quantitative approaches to validate the relationships among the technological, organizational, and environmental dimensions of the Technology–Organization–Environment (TOE) framework in shaping agripreneurship adoption.

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